Size-dependent nonlocal effects in plasmonic semiconductor particles

Localized surface plasmons (LSP) in semiconductor particles are expected to exhibit spatial nonlocal response effects as the geometry enters the nanometer scale. To investigate these nonlocal effects, we apply the hydrodynamic model to nanospheres of two different semiconductor materials: intrinsic InSb and n-doped GaAs. Our results show that the semiconductors indeed display nonlocal effects, and that these effects are even more pronounced than in metals. In a 150 nm InSb particle at 300 K, the LSP frequency is blueshifted 35%, which is orders of magnitude larger than the blueshift in a metal particle of the same size. This property, together with their tunability, makes semiconductors a promising platform for experiments in nonlocal effects. Copyright (C)EPLA, 2017